G R S IX-5]

Previous references

Mc 237-15 & 3rd B June 1916
" 158- & 1-2 B May 16, 1917.
(Municipal)

Later references

Mc 158-16 & 4
" 158- & 1-2

File No 158-16

Serial Nos 1-2

GENERAL AND REVENUE SECRETARIAT.

Serial Nos 1-2

Part B for February 1917

SUBJECT

Report on work done in connection with the Malarial Survey in the Bangalore city for 1915-16 with a recommendation to continue the staff in connection therewith till the end of June 1917

G.O No 4995-7 & 2 2 17

Records the report and vote on the Malarial Survey, Bangalore city, for 1915-16

W D 83—GPD—50,000—24-7-16

Mr Bangalore 19 3 17

GENERAL AND REVENUE SECRETARIAT

(Medl)

NOTES

File No 156/16

FILE HEADING

Malarial Measures, Bangalore Cly.-

From

The Sanitary Commissioner,

No. 9 C 28/ Dated 13. 12 1916 Received 14 12 1916

Diary No	1902 Enclos 1 2 4/4 Spare Copies	Serial No 1

BRIEF ABSTRACT OF LETTER

Forwards Report on work done in connection with the Malarial Survey in the Bangalore Cly. for 1915-16, & recommends that the Special staff in this connection may be sanctioned to be kept on till the end of June 1917 & that the Malarial investigation should be carried out by the Med Coll, the Sanitary Comr & the Director of Public Health Institute cooperating with the Med Coll whenever professional guidance is necessary.

NOTES AND ORDERS

Orders are required on the following points -

(i) Continuance of the Spl Est till the end of June;

(ii) Is it the State Sanity Dept or the Med Coll that has to continue to make Malarial investigation.

NOTES—First Sheet.

WD 1238—GPB—60 000—1-12-16—S.

1912

G R S III-2]

General and Revenue Secretariat | ML File No 156 of 1916

Serial No

(1) Who has to undertake the duty of educating the masses in Sanitary Hygiene & Physiology

2 Submit for Orders

HMcK

23.12.1916

26/12

3. The continuance of the Scheme up to End of June 1917 may be sanctd —

to regards the continuance of the work after the Survey is over the Sanitary Commr may be asked to review the work done by the Staff & submit his suggestions for orders of Govt.

HP 11/1-17

Second Member —

4 Papers with the Secretariat Sanctioned

HP 19.1.17

4 A draft-GO is put up.

HP 19/1-17

HMM 23/1/17

Rec'd Secy

In approval

HP 27/1-17

25/1

H.M. & D

To back second Members return Please put up a Copy before.

HP 28/12/16

Secretary Health & C.K. Bs

105 12-1-17

H. 19.11

NOTE—Contn sheet

1917 (B)

G R. S 12]

General and Revenue Secretariat | Mund File No 126 of 1916.

Serial No.	
5	Issue and submit to Dewan for perusal. 29/1/17 — 29/1-17
2	To (1) The Sanitary Commissioner (2) " President, Munt Council, Bangalore City (3) " Comptroller No 4995-7 Records the report and note with an observation, & a remark that the report for 1916-17 should be submitted in due course. Sub^d for kind perusal — 7/4/17 Dewan)
	451/ 12-17 Seen by the Dewan 12/2/17 13/2-17

NOTE—Contn sheet

GPB—70 000—17 12 1

Office of the Sanitary Commissioner
with the Govt., of Mysore,

Dated, Bangalore, 13th December 1916

No. G 6221/ Ene 14 1 feb

1 5 DEC 1916

P 1902 Mul 23775 15-16-1

From

Rajakarya Pravina Rao Bahadur
T.V.Srumugum Mudaliar, Esq., M.B C.M.,
Sanitary Commissioner to the Govt., of
H.H.the Maharaja of Mysore, Bangalore.

To

L.Krishna Rao Esq., B.A.,
Secretary to the Government of H H.the
Maharaja of Mysore, Revenue Deptt.,Bangalore.

Sir,

I have the honor to forward herewith letter No.183 dated the 21st/23rd November 1916 from the Honorary President, Municipal Council, Bangalore city, submitting a report on work done in connection with the Malarial Survey in the City for the year 1915-16 and to recommend that the continuance of the special staff until the end of June 1917 may be sanctioned

2. As regards the suggestion that the work initiated by the Municipality should be taken up and continued by the Sanitary Department, I find the proposal to be based on a rather startling argument - that " the writings in the public press go to show that the question of Malaria Prevention in the Malnad Improvement Scheme has not been based on a scientific basis and that Work undertaken on this behalf in the city is not unlikely to be useful to the State as a whole". Without entering into a discussion of the matter, I might say that the problem of malaria prevention in the Bangalore City is a purely local one and there can be no justification if, with a sanitary expert of their own and having all other facilities for investigation at their command, the Municipal Council should choose to pass the work so well begun on to other hands. For professional guidance that might be required at any stage of the investigation the Sanitary

Commissioner

(See page 16 of the Memorandum Sheets for note.)

From The Sanitary Commissioner
to Government
in Empire
14 DEC 1916
To The Secretary to Govt
Revenue Department
Bangalore

Dated 13. 12. 16

Despatched

Received

General No. G.C 231

No.

Enclosure No. One Letter

Forwarding the report on work done in Connection with the Malarial Survey in the Bangalore City for 1915-16

Commissioner as well as the Director of the Public Health Institute will be prepared to cooperate to the fullest extent. But the investigation itself is best carried out by the Municipality.

3. The suggestions put forward under the head "Educative" have already had the consideration of Government as a result whereof Government have been pleased to sanction the formation of a Committee for the furtherance of sanitary education. I am afraid a mixed organisation of the kind proposed by the Municipal Council, for educating the masses in one city and exclusively in one subject, savours too much of artificiality of arrangement and, if brought about, would be apt to lack in cohesion When the time is ripe to inaugurate a system of public lectures the Sanitary Department will not of course be slow to seize the opportunity to press forward Sanitation to find its proper place among the subjects for such lectures. In the meantime, the City Health Department should spare no pains to spread sanitary knowledge in their area, enlisting if necessary, the cooperation of the Committee recently sanctioned by Government

I have the honor to be,
Sir,
Your most obedient servant,

Sanitary Commissioner

(6

B M 109]

OFFICE OF THE PRESIDENT,
MUNICIPAL COUNCIL,

Enc to Mul 156-16-1 BANGALORE CITY, DATED 21-11- 1916

FROM

DEWAN BAHADUR RAJA SABHA BHUSHANA
K P PUTTANNA CHETTY, Esq,
Honorary President, Municipal Council,
Bangalore City

To

The Secretary to the Government of
His Highness the Maharaja of Mysore,
~~*Generalcum*~~ *Revenue Department,*
Bangalore

(Thro' The Sanitary Commissioner to the Government of Mysore)

SIR,

2 Adverting to para 2 of Government Proceedings No 205-6/Ml. 237-15-4 dated the 10th July 1916, calling for a report on the work done in connection with the Malarial Survey in the City during the year 1915-16, I have the honor to submit herewith for the information and orders of Government, copy of the Health Officer's memo No 153 dated the 24th July 1916 containing a report on the survey work done during 1915-16 and of the Vice President's note dated the 2nd October 1916 on the subject

2 Both the report and the note were placed before the Municipal Council at their meeting of the 4th November 1916 - when it was resolved that the report with the appendicies be submitted to Government through the Sanitary Commissioner with the request that further investigation might be carried on by the Public Health Department of the State, the Municipal Council carrying out such anti-

malarial

GPB—2,000—20-8-15

1916-17

From The Honorary President
Municipal Council
Bangalore city

To The Secretary to the
Government of Mysore
Revenue Department
Bangalore

{Thro The Sanitary Commissioner
to the Government of Mysore

Dated 21st
Despatched 23rd } November 1916

Received

General No 183
No

Enclosure No. One & one file
Attachments, Sent
Separately

Submitting a report on the
work done in Connection with
the Malarial Survey in
the city for the Year 1915-16

anti-malarial measures as may be prescribed by the Sanitary Commissioner.

3. The temporary establishment appointed for doing Malarial Survey work, the continuance of which till the end of the current year was sanctioned in the Government order quoted above - will be retained till 30th June 1917 for completing the Survey in the remaining Divisions, pending final orders of Government Copy of the Municipal Council's resolution is herewith submitted.

4. The results of the investigation clearly point to the garden lands adjoining the Bamboo Bazaar Road forming one of the most important (if not the only) centres from which infection radiates to surrounding areas. Very early steps are under contemplation to acquire these lands and to improve the locality by sub-soil drainage and other means

5 The Vice President's recommendations under the head "Educative" (Vide para 11 of his memorandum) seem to deserve careful and earnest consideration The profound ignorance of the elements of Hygiene and Physiology even in otherwise well informed circles cannot but have the most serious consequences on the Public Health of the Country

I have the honor to be,

Sir,

Your most obedient servant,

Honorary President

C.R G.

Proceedings of an ordinary general meeting of the City Municipal Council, Bangalore held in the Council Chamber, City Municipal Office on Saturday the 4th November 1916.

Encl to Govt 1156-167

Present.

1. Dewan Bahadur Raja Sabha Bushana K.P. Puttanna Chetty Esq., Honorary President.

2. R. Subba Rao Esq., M.R.C.V., L.S.Sc., Vice President.

3. F. Fernales Esq., L.R.C.P & S (Edn) L F.P & S (Glas) Health Officer.

4 Rev. D A. Pegs.

5. C.V. Narasimha Iyengar Esq., B.A., B.L.,

6. Father P.M. Briand.

7. D.B. Ramachandra Mudaliar Esq.,

8. B.Chinnaswamy Chetti Esq.,

9. B.K. Garudachar Esq.,

10. M. Ramachandra Rao Sindhe Esq.,

11. D V. Gundappa Esq.,

12. N. Surappa Esq.,

13. G. Siddaveerappa Esq.,

14. D. Adeppa Esq .

15. B.V. Ramaswamy Chetty Esq., B.A.,

16. B. Usman Khan Esq.,

17. M. Subbayya. Esq., B.A.,

18. M. Abbas Khan Esq.,

19. M.K. Krishnamurti Rao Esq.,

20. D. Venkataramayya Esq., B.A.,

21. S. Venkataranga Iyengar Esq.,

Absent.

1. N Ramayya Esq.,

2. S. Venkata Rama Iyer Esq., B.A.,

3. M. Basavayya Esq., BaA., B.L.,

Health Officer s memo No 153 dated 24th July 1916, submitting a report on the working of the Malarial Survey in the City during the year 1915-16 Senior Vice President's note thereon dated 2nd October 1916

Resolved that the report with the appendicies be submitted to Government

(7)

Government through the Sanitary Commissioner with the request that further investigation may be carried on by the Public Health Department of the State, the Municipal Council carrying out such anti-malarial measures as may from time to time be prescribed by the Sanitary Commissioner The staff appointed by the Municipality for doing Malarial Survey work may be retained till the end of the current official year for completing the Survey in the remaining Divisions of the City pending final orders of Government Immediate steps should be taken to acquire the garden lands on either side of the Bamboo Bazaar Road as far as the main drain to the South, with the view of doing away with what has been clearly established to be the focus of Malarial infection for the Old City

Sd/- K P Puttanna Chetty,
Honorary President

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* C O P Y *

For Hon President

C R.G

Report on the Malarial Survey work done during the year 1915-16

Since the City is congested and most of the houses are ill-ventilated, it was thought that the Malarial Survey of the City should be done in preference to the extensions where the people are all educated and the houses are built on sanitary principles. So the Malarial Survey of the City was begun in the month of July 1915 and the portion of that of the City finished is in detail as follows -

First a portion of the 2nd Division was taken. The boundaries of which are as follows -

North - Race Course Road
East - Balepet Road.
South - Taluq Cutcherry Road
West - Kammannugundy Road.

Since there were many block maps that included the above mentioned portion of 2nd Division, the whole portion was divided into as many blocks as it was convenient and necessary for us to work in The whole portion has been worked out in detail as mentioned under the following heads in 5 blocks A sketch map of Bangalore City, showing the areas surveyed, is herewith apponded

Block No. 1 2nd. Division.

Boundaries -

North - Feeder Channal of Dharmambhude Tank and Race course Road
East - Subedar Chatram Road
South - Narasimhanna's Lane by the side of Cooparapet Police Station
West - East Tank Bund Road of Dharmambhude Tank

General sanitary condition -

The premises of the choultry are kept dirty by the collection of cowdung etc and behind the choultry is a wild growth of lantana which forms a resorting place for musquitoes nuisance is being committed by the Vodders who have erected the huts in the vacant land

Average level of sub-soil water - 25'
Number of children under 12 years of age examined - 31
Number with enlarged spleen - 1
Splenic Index.- 3%
Number of female anopheleene Musquitoes collected within dwellings - 2
Identification of the above - A Rossi
A. Culicifacies.

(W

Results of dissection - No parasite was found either in the stomach or in the salivary gland

All the 15 wells and 1 pool that were in the block were examined for musquitoes larvae they were found in the block in 4 wells and 1 pool There were 6 potential breeding places of which 3 were ditches and 3 wells.

The musquitoes that were bred from the above wells, pools etc were identified as anopheles Rossi and culex.

Block No. 2 2nd. Division.

Boundaries -

North.- Cottapet Police Station
East - Ballepet Road.
South - Purniah Chattram Road, Kottege Lane and T.K Road
West - Compound wall of Municipal Garden near nursery

General Sanitary condition -

This block is ever-crowded and most of the houses are ill--ventilated

Averegee level of sub-soil water.- 22½
Number of children under 12 years of age examined - 27
Number with enlarged spleen - 1
Spleenic Index - 4 % nearly.

No female anophelene musquitoes were collected within dwellings in this block

All the 31 wells of this block were examined for musquito--larvae and they were found in 3 wells

There are 4 potential breeding places of which 3 are ditch--es and one cistern

Five cisterns are also examined for musquitoe larvae in this block, and in 4 of which, larvae were found

Identification of musquitoes bred from wells, cisterns etc.,

A Stephensi, A Rossi, Culex.

Block No 3 2nd Division

Boundaries -

North - Purniah Chattram Road
East - Thelasithotam Lane
South - T K Road
West - Kottege Lane

General sanitary condition -

This block is very much congested and the houses are

are ill-ventilated. Sewage stands stagnant in some of the lanes.

Average level of sub-soil water - 20'
Number of children under 12 years of age examined - 97
Number with enlarged spleen - 8
Splenic Index - about 8 %

No female anopheleine musquitoes were collected within dwell-ings in this block

All the 25 new wells of this block were examined for mus-quitoe larvae and in 4 which larvae were found.

There are 3 potential breeding places of which 2 are wells and 1 is a ditch

The female anopheleine musquitoes bred from the above wells are A Rossi, and Culex

Block No. 4

Boundaries -

North - Purniah Chattram Road
East - Balepet Road
South - T K. Road.
West - Tholasithotam Lane

General sanitary condition -

This block is also overcrowded and the houses are ill-ventilated

Average level of sub-soil water - 20'
Number of children under 12 years of age examined - 239
Number with enlarged spleen - 21
Splenic Index - 9 %

No female anopheleine musquitoes were collected within dwell-ings

All the 62 wells of this block were examined for musquitoe Larvae and in 7 of which, larvae were found

The musquitoes bred from the above wells are - A Stephensi and Culex

Block No. 5 2nd Division -

Boundaries -

North - Tank Road
East - Municipal Garden Compound Wall
South - T K Road
West - Railway Goods-shed Road

General sanitary condition -

The houses are overcrowded and ill-ventilated

Average level of sub-soil water - 24'
Number of children under 12 years of age ~~were~~ examined - 584

umber with enlarged spleen - 15
Splenic Index - 3 %

Number of female anophelene musquitoes collected within dwellings was 2o and their identification was A Rossi and A Stephensi

Results of Dissection - No parasite was found either in the stomach or in the salivary gland

There are two potential breeding places, which are two wells

All the 66 wells of this block were examined from mala- musquitoe larvae and in 13 of which larvae were found and the musquitoes bred from the above were A Stephensi, A Rossi and Culex

Summary of the whole of 2nd Division that has been yet surveyed is as follows -

Boundaries has been given in the beginning of the report As regards the general sanitary condition the whole portion of this division is overcrowded and the houses are ill-ventilated except some few ones

The averege level of sub-soil water - 22'

978 children under 12 of years of age were examined for enlarged spleen and 46 of them had it So the splenic Index comes of-enlarged to about 5% nearly. The names and addresses of the cases of enlarged spleen have been entered in a register maintained for the purpose. As it is extremely difficult to induce children to give their blood for examination, it could not be done on a large scale So blood smears from 6 children only were taken and no Malarial parasite was found in them

The female anophelene musquitoes were collected within dwellings were 28 in number and they were identified as A Stephensi, Rossi and Culicifacies and no parasite was found in them after dissection

The total number of potential breeding places was15, of which 7 are wells, 7 ditches, and 1 cistern

All the 202 wells were examined for musquitoe-larvae and in 31 of which, larvae were found There was a pool also in this portion of this Division and larvae was found in it. The Identification of musquitoes bred from the above wells and pools is A Stephensi, A Rossi and Culex.

A portion of 1st and 4th Divisions -

Boundaries -

North - Residency Road.
East - Sampege Tank Raod as far as Queen's Statue
South - Jail Road and Cenotaph Road
West - Avenue Road

General Sanitary condition -

There are some potential breeding places and wild growth of lantana behind the Government Press and in the surroundings of Residency.

Averege level of sub-soil water - 19'

As there are not many residential houses in this locality splenic Index was not taken

There are only four potential breeding places of which two are wells and two pools.

All the 13 wells that were in this block and also 12 pools, ditches etc were examined for musquitee larvae In 8 of the wells and 5 of the pools. Larvae were found

The musquitees bred from the above are identified as Anopheleme Rossi, Culex, and Anophelene Listeni

5th Division -

The boundaries of the whole of the 5th Division are the following -

North - Nagarthpet
East - Mission Road
South - Heskote Road
West - Avenue Road

As mentioned in the begining of the report the whole area bounded by the above named boundaries, is divided into as many blocks as it was convenient for us to work in the detail work of each block is as follows -

Block No 1

Boundaries -

North - Taluk Cutcherry Road
East:- Kammannu Gundy Road
South - Bhadrappa's Road
West - Venkataramana Naik's and Advocate Ramaswami Sett's Lane

General Sanitary condition -

The whole block is overcrowded and most of the houses are -ill-ventilated and some have no ventilation at all The sewage stagnates in most of the drains of the Bye-lanes some of the houses have yet pit system of conservancy due to the want of

Conservancy lanes

Averege level of sub-soil water - 13'
Number of children under 12 years of age examined - 430
Number with enlarged spleen - 110
Splenic Index - 25 % nearly.

20 female anophelene musquitoes were collected within dwell -ings and they were identified as A Listeni, Stephensi, Rossi And on dissection of the above, no parasite was found in either in the stomach or in the salivary glands . All the 40 wells that were in this block were examined for musquitoe larvae and in 4 of which larvae were found and the musquitoes bred from the above were identified as Culex and anophelene Stephensi

Block No. 2

Boundaries:- North - Bhadrappa's Lane
East - Cross Road joining Nagarthpet and Hoskote Rd
South - Hoskote Road
West - Gardens and Benkenawab Street

General sanitary condition -

The same as the above block, but this one contains wild growth of lantana in addition

The same- Averege level of sub-soil water - 7'
Number of children under 12 years of age examined - 118
Number with enlarged spleen - 93
Splenic Index - 78%

20 female anpphehene musquitoes were collected within dwellings and they were identified as A Stephensi A Rossi and on dissection no parasite was found in them.

All the 47 wells, that contained in this block, were examined for musquitoe-larvae and in 11 of which they were found The musquitoes bred from the above were identified as A Stephensi Rossi and Culex

Block No 3

Boundaries:- North. Bhadrappa's Street
EasT - Mundy Erappa's Lane and Gardens
South - Hoskote Road.
West - Avenue Road

General sanitary condition - The same as the above except that there is a reservoir of sewage in the gardens behind the dwellings houses of this part of 5th Division Averege level of sub-soil water - 3½'
Number of children under 12 years of age examined - 200
Number with enlarged spleen - 93
Splenic Index - 46%

30 female anopheleno musquitoes were collected within dwellings and they were identified as A Rossi, and on dissection no parasite was found in any one of them

All the 102 wells were examined for musquitoe-larvae and in 13 of which larvae were found. The musquitoes bred from the above, were A Stephensi, A Rossi, Culex

There was also found a tubful of musquitoe larvae and the musquitoes bred from them were Culex.

Block No. 4 Boundaries - North - Nagarthpet
East - Venkataramana Naik's Lane
South - Bhadrappa's Lane
West - Avenue Road

General Sanitary condition -

The whole block is overcrowded and the houses are ill-ventilated except a few good bungalows almost all houses have pit system of conservancy due to the want of conservancy lanes.

Averege level of sub-soil water - 14'
Number with enlarged spleen - 73
Number of children under 12 years of age examined - 678
Splenic Index - 11%

20 female anopheleno musquitoes were collected within dwellings and they were identified as anopheles Stephensi, and on dissection no parasite was found in them All the 112 wells of this block were examined for musquitoe-larvae and in 18 of which, larvae were found The musquitoes bred from the abo wells were identified as A Stephensi and Culex There was also found potful larvae and the musquitoes bred from them were A stephensi

Block No. 5 Boundaries - North - Nagarthpet
East - Mission Road
South - Hoskote Road
West - Lane joining the Nagarthpet and Hoskote Road

General Sanitary condition - There are one or two dilapidated houses where nuisance is being committed by the neighbours

Averege level of sub-soil water - 6 2/3'
Number of children under 12 years of age examined - 12
Number with enlarged spleen - 1
Splenic Index - 8 %

All the 6 wells in this block were examined for mus-
-quitoe-larvae and in 20 of which, larvae were found, the musq-
-toes bred from them were identified as Culex and A Stephens-

Summary of the whole of the 5th division is as

Summary of the hole of the 5th Division is as follows -

The boundaries of the whole of the 5th Division have been given in the beginning -

General Sanitary Condition - The whole division is overcrowded and houses are ill-ventilated The drainage in some of the portions is not good. Majority of houses have pit system of Conservancy In some places there are growths of lantana Averege level of sub-soil water - 8'

1438 children were examined for enlarged spleen in this division and 370 of them had it. The spleniw index of the whole Dn. comes to about 25 % The addresses of those, who had who enlarged spleen, have been entered in the register maintained for the purpose As it was extremely difficult to induce children to give blood for examination, it could not be done on a large scale, So blood smears from only 5 boys were taken and no parasite was found in them

The number of female anophelene musquitoes collected within dwellings is 80 and they have been identified as A Stephensi, Rossi, and Culex

There were 4 potential breeding places and all of them are wells The rest 307 wells were examined for musquitoe--larvae and in 48 of which larvae were found and the musquitoes bred from them were identified as A Stephensi, Rossi, and Culex There was one potful of larvae found and the musquitoes bred from which, were A Stophensi and one tubful of Culex Larvae

6th Division - Boundaries - North - Hoskote Road
East - Lalbagh Road and Mission Rd
South - Lalbagh West Gate Rd and Basavangudy Road
West Hosur Rd or Kalasipalyam Rd

The whole area bounded by the above named boundaries is divided into 4 blocks namely - 1 Kalasipalya and its surroundings
2. Gangamcherry and its surroundings.
3 Korcharpalya and its surroundings
4. Doddamavally, chickamavally, Coparsehally and their surroundings.

1. Gangamcherry and its surroundings -

Boundaries - North - Hoskote Road
East - Wesleyan Mission School and garden near Lal-bagh
South - Mavally Tank
West - Hosur Road and Lascar Lines

General sanitary condition - 75 % of the dwelling houses re-

118

are ill-ventilated. No drains or proper roads are made for the whole whole block. People of this block complain for in-sufficiency of water taps There are also wild growths of lantana in certain places.

Average level of sub-soil water - 10½'
Number of children under 12 years of age examined - 520
Number with enlarged spleen - 117
Splenic Index - 22%

20 female anopheleene musquitoes were collected within dwellings and they were identified as A Rossi, Listoni, and Stephensi, on dissecting them, no parasite was found

There were 2 potential breeding places of which one is a well and the other a ditch

All the 112 wells of this block were examined for musquitoe-larvae and in 51 of which larvae were found, and there were other breeding places, as pots, stonemortar, cisterns, total being 5 in number. The musquitoes bred from the wells and other breeding places were identified as A Rossi, Stephensi, Listoni, Nigerrimus, Culicifacies and Culex

2 Kalasipalyam and its surroundings -

Boundaries -

North - Lascar Lines

East - Gardens and Slaughter House

South & West - Hosur Road

General Sanitary Conditions -

Most of the houses are overcrowded and ill-ventilated There are many dilapidated buildings which are in dangerous condition and which have been the cause of great nuisance to the neighbours The back-yard of some of the houses have been overgrown with wild shrubs and lantana The lower part of Nimboji galli is not well drained and as such the sewage stagnates here and there emanating abominable smell

Average level of sub-soil water - 22'

Number of children under 12 years examined - 343

Number with enlarged spleen - 134

Splenic Index - 39%

28 female anopheleene musquitoes were collected within dwellings and they were identified as A Rossi, Fullinosus

culex and on dissecting them, no parasite was found

There are 6 potential breeding places and they are wells

The rest 160 wells and 6 pools were examined for musquito-Larvae and in 25 of the wells and 3 of the pools, Larvae were found and the musquitoes bred fromm them were identified as A Listoni, Stephensi, Culicifacies, Barbirostris, Niverrimus, and Culex

3 Koracharapalya and its surrounoings -

Boundaries -

North - Hosur Road and KoracharaPalya main Road

East - Roshun Bagh Road

South - Gardens of Basvangudi

West - Vokkaligara Sangha Hostel

General Sanitary conditions -

There is no proper drainage and most of the houses are ill-ventilated The surroundings of this block are kept very dirty by the collection of rubbish and overgrowth of lantana There are many dilapidated houses which are made use of as public labrines

Average level of sub-soil water - 31'

No of children under 12 years of age examined,-288

No with enlarged spleen -~~24~~ 24

Splenic Index -8%

50 female anopheleme musquitoes were collected within dwellings and they were identified as A Listoni, Culicifacies and on dissecting ~~them~~, no parasite was found in them

There are 8 potential breeding places which are all wells The rest 43 wells were examined for musquito-larvae and in 5 of which the were found The muneuitoesred fromthem were identified as A Listoni, Culex

4, Dodda Bavahalli, Chicka Bavahalli and Ooparahally -

Boundaries - North - Mavally Tank
East - Lalbagh
South - Lalbagh west Gate Road
West - East Road Basavangudy

Average level of sub-soil water - 22'

General sanitary condition - Most of the houses near lalbagh are dilapidated and their is a wild growth of lantana in these houses and their neighbourhood so that it is very difficult to see our way through it Almost all houses are ill-ventilated and kept very

Fluviatilis, Stephensi, Listoni, Culicifacies, Barbirostris, Nigerrimus, Culex, Stegomyia

Summing up them the result of our last years work, we see that the 5th and 6th Divisions are particularly more malarious and liable to infection than any or the other portion of the City yet surveyed, this is particularly due to the level of sub-soil water being as high as 8' in 5th Division and also lack of drainage

The general sanitation of these Divisions also, is far from being satisfactory due to the overcrowding of the houses then ill-ventilation + lack of daily conservancy system During our survey work, we met with many dilapidated houses overgrown with lantana and other shurbs One particularly striking feature about these Divisions was unusually large No of pools and wells which contained malarial mosquito Larvae there being 48/307 such places in 5th Division and as many as 122/453 in the 6th Division!

It is not surprising then that the splenic index should also be unusually high being 25% and 26% respectively in the 5th and 6th Divisions. As was to be excepted from such a state of affairs, the number of female anophelene musquitoes collected within dwellings was large being 128 in the 6th and 80 in the 5th Divisions It was very noticeable that even among the adult and old men, there were such enlarged spleens as to occupy the whole of the abdomen What else but Malaria can be the cause of these sickly-looking and Anemic faces!''

There is not much to say about the other portions of the City surveyed But this does not mean that the locality is altogether devoid of Malaria A look at the statistics collected will show that even in these Divisions, there are cases of enlarged spleen

In conclusion, then, we would bring to the notice of the Government and that, unless means such as musquitoe-reduction and prevention by treatment are taken and that too, quickly there is no salvation for these poor people to get rid of the Malaria pest A Malaria-free Bangalore will only be possible when breeding places are avoided and the people are given better sanitation, conservancy, drainage and good treatment . Fortunately Malaria is of all diseases, the one, regarding which, we possess perhaps the fullest knowledge since we know the cause of it, the manner in which it is spread, a specific

(12)

cause for different methods of prevention It is our own fault if we do not reduce it as much as possible.

We may add also, where-ever the musquitoe pest was very trouble-some, the insanitary and stagnant pools were treated with Kerosine oil and drained off and wherever possible filled up. For carrying on a systematic and organised antimalarial campaign, it is necessary as a preliminary step to under-take a malarial survey When this is completed, proposals will be submitted for the proposed campaign. In the meantime as we are going on with our survey, we, wherever possib-ble do every effort to minimise the prevalence of Malaria.

J. Fernandes

Health Officer,
Bangalore City

K.S.Rao.

Enc to Govt 156-161.

Office of the Municipal Council,
Bangalore City, dated 29th September 1916.

M E M O

In submitting herewith the Health Officer's report on the Malarial Survey of the City, I beg to add the following remarks, this might perhaps to some extent be necessary as the Municipal Council sanctioned the scheme at my instance and I was in charge of the Survey work during the 1st half of the period covered by the report

2. It will not be forgotten that the Malarial Survey of the City was necessitated by the too unauthorised an assumption of the existence of Malaria in the City to any or some extent Blood examination neither was nor is a routine procedure, the various kinds of mosquitoes prevailing in the City had not been classified, and no attempt had been made to gauge the extent of malarial infection in the City Yet it was known that there were numbers of children with enlarged spleen in most parts of the City The swarms of mosquitoes during certain parts of the year and the coincident occurrence of an extraordinarily large number of fever cases naturally led to the impression that malaria must be prevalent to an indefinite extent. Some people held that the public health of the City under this head was steadily deteriorating while others adopted a more complaisant attitude - in either case without sufficient reason, while in its anxiety to be doing something the Health Department in a spasmodic manner treated pools with gas works waste and kerosine oil emulsion without endeavouring to ascertain to what extent this did not result in the frittering away of energy time and labour - not to speak of the false sense of security engendered in the mind of the public It was

a consideration of all these circumstances that led to the Municipal Council directing an investigation into the subject in their resolution dated 29th August 1914 The necessary staff however was only available by the end of the year 1914-15 so that the Survey work really was taken up from the commencement of the year 1915-16

3 The staff appointed for the purpose consisted of a Sub-Assistant Surgeon, a draftsman and two peons at a total cost of Rs. 84/- per mensem. Liberal provision had been made for the purchase of books and appliances The total expenditure incurred during the year came to Rs. 1054-12-1 The Sanitary Commissioner also was pleased to sanction an expenditure of Rs. 228-12-0 out of State Funds for the purchase of microscopes and apparatus primarily for the purpose of demonstration during public lectures and these were also used in the Malaria Laboratory, during the course of the enquiry

The areas wherein the Survey work was carried out (vide appendix I) comprised of the Cubbon Park and its surroundings in the 1st Division, all the locality beneath the Dharmambudy tank bund up to the Taluk Cutcherry Road in the 2nd Division and the whole of the 5th and the 6th Divisions

4 The investigation undertaken may be classified under the following heads -

i Is Malaria prevalent in the City ? If so, to what extent ? Is it on the increase or decrease ?

ii What are the circumstances, if any, that tend to keep it up or to facilitate its propagation ?

iii. What measures are indicated in the light of the preceding facts to minimise if not eradicate its prevalence ?

The basis of the report

5. The doubt expressed in the 1st sub-section of the preceding paragraph with regard to the existence or otherwise of Malaria in the City might provoke some amusement as both Medical men and laymen have only too commonly accepted the view in the affirmative. The diagnosis is usually made from the clinical symptoms and as already stated it is uncommon for the diagnosis being confirmed by blood examination except perhaps in the Victoria Hospital. The test of a fever having been malarial in origin is frequently its ready amenability to quinine rather than quinine being administered in a known case of Malaria I cannot say that an endeavour has been made in our investigation to remedy this defect, partly because the Health Officer is vested with too many responsibilities to be able to devote much attention to pathological work and partly owing to the programme embracing too wide a range of study for a small and unskilled staff Barring the identification of the Malarial Parasite in every case pronounced to be Malaria, the most reliable test of its existence is the occurrence of chronically enlarged spleen with the coincident prevalence of mosquitoes known to propagate Malaria We devoted most of our time to these aspects of the question and though the results of our enquiries are, for the reason specified above, not as scientifically accurate as they should have been, I have still no doubt that they are of sufficient value for taking practical action towards the initiation of effective Anti-malarial measures The basis then of this report is an enquiry (a) concerning the extent of chronically enlarged spleen in persons most susceptible to Malarial infection (b) into the Malaria - carrying mosquitoes prevailing in the City and (c) into the recorded statistics of deaths under 'fevers' If it were

justifiable

justifiable to assume that a certain proportion of fevers was invariably due to Malaria, an investigation into the trend of public health of the City for a number of years with respect to the death rate under 'fevers' will give us a rough idea of the progressive increase, decrease or equilibrium in the prevalence of Malaria in the City

6 With regard to the 2nd sub-section of paragraph 3, the only known method of propagation of Malaria being through particular varieties of mosquitoes, our efforts were directed towards the examination of all places known or suspected to be or become the breeding grounds of mosquitoes Absolute proof of a particular variety of mosquito conveying Malaria is the identification in its tissues of the Malaria parasite undergoing various stages of development We should therefore have dissected a very large number of mosquitoes and confirmed our conclusions by this infallible test, but as I have already explained this would only have been possible if the Health Officer was exclusively set on this work It should however be mentioned that certain varieties of mosquitoes known to be pre-eminently associated with the conveyance of Malaria in upper India, Madras, Ootacamund &c do also exist in the City and the extraordinary coincidence of their breeding grounds and the existence of cases of enlarged spleen in the immediate neighbourhood can lead only to one conclusion The most hopeful circumstance from our point of view is the comparitively small number of places where such mosquitoes are found to breed compared with the numerous breeding grounds (actual or potential) that abound in the City.

A great deal of attention was paid to the identification of the several kinds of mosquitoes. The identification of the closely allied species is no easy matter, and I had to frequently get the results of my identification confirmed with specimens by Doctor Christophers of the Kasauli Research

Institute

Institute I also took occasion to secure the assistance of Rao Bahadur Khazan Chand (one of the Assistants at the Research Institute) when he was at Bangalore on a short visit

7 With regard to the 3rd item specified in para. 3, it was not possible to pay any great attention to the natural causes that are inimical to the growth of mosquitoes. Some experiments were made with varieties of fish but this was done more in a spirit of curiosity than on the large scale necessary for the deduction of scientific results.

The method of work

8. A reference to appendix II shews that after defining the boundaries of an area, a general impression of the Sanitary condition of the locality was first noted down The Sub-Assistant Surgeon next proceeded to examine the children in the locality for enlarged spleen The address of infected children was noted Simultaneously specimens of mosquitoes were caught from dwellings for subsequent examination. The staff next proceeded to measure and note on the block plan all potential and actual pools existent in the area By potential pools should be understood hollows or pits where there was no water at the time of examination but which could during and after rains contain water taking varying intervals of time for drying up. All pools, tanks, wells &c were repeatedly examined for mosquito Larvae and numbers of them collected and carried to the Laboratory for further growth. The depth of the sub-soil water in each locality was measured and the brackishness or potability of each specimen examined In the Laboratory the Larvae grew up into the adult forms within varying periods ranging from a few days to three or four weeks and the specimens were destroyed after identification The block

plans

age examined, 821 had enlarged spleen giving a ratio of over 20.6% The* marginally noted statement shows the splenic indicies of the various component blocks of the several Divisions wherein investigation was conducted. Compare these figures with the following being the splenic indicies of some of the towns in the State known for the unsatisfactory state of their public health Viz Mudigere 27.1%, Koppa 67.3%, Hariharpur 30.5%, Chickmagalur 12.08%, Heggadadevankote 25 4%

The level of sub-soil water

As will be seen from the marginal statement the average level of sub-soil water in the several blocks varies from 3½' in the 3rd block of the 5th Division to 21' the average level in the 2nd Division. I do not think that there are at present sufficient data to specifically connect the level of the sub-soil water with the prevalence of Malaria but a reference to the plans of the 2nd and 3rd blocks of the 5th Division and to the statement of splenic indicies cannot but be suggestive

Division.	Block.	Level of sub-soil water in feet.
II	1	25
"	2	22½
"	3	20
"	4	20
"	5	24
V	1	13
"	2	7
"	3	3½
"	4	14
"	5	6
VI	1	10½
"	2	22
"	3	31
"	4	22

The prevalance of mosquitoes.

In the areas of the City wherein investigation was conducted there were altogether 987 pools containing water at the time of examination There were, in addition, 30 hollows where water would stagnate during rains. The size, shape

and

concerned with the propagation of Malaria in the City. It will also be noticed that the prevalence of Malaria diminishes according to the distance from such pools, though I am not prepared to define the ratio between distance and diminution. Incidentally this throws light on the habit of the mosquito which renders it almost akin to human beings in being constitutionally non-migratory Of 117 places wherein Malaria carrying mosquitoes were breeding, 47 were fresh water wells in Tigalar's gardens with an average depth of sub-soil water of 9 feet, 37 were fresh water wells in residential parts of the City close to the preceding with an average depth of sub-soil water of 13½ feet, 10 were disused fresh water wells in busy parts of the City with an average depth of sub-soil water of 23 feet, 18 were fresh water wells in active use with an average depth of sub-soil water of 19½ feet and 5 were shallow pools of rain water in the Cubbon Park and Mavally. Generally speaking the variety known as nyssorhynchus stephansii seems to affect deep wells of fresh water specially when in disuse and myzomya listoni the shallow wells of garden lands It is not a little curious that the water edge of the Dharmambudi tank was remarkably free of mosquito larvae - a few of the culex kind being found after a good deal of search.

Circumstances inimical to the growth of mosquitoes.

I have stated in an earlier part of my memorandum that serious defect in the investigation was the utter absence of systematic effort in enquiring into the natural circumstances inimical to the growth of mosquito larvae in general and of the malaria-carrying mosquito in particular. On the general assumption that the smaller varieties of fish tend to the disappearance of mosquito larvae in water, I conducted a few simple experiments during the early part of the year The kinds known as " ಬಿಳಿ ಪೈ, ಕೆಸ್ತ " and " ಪೈಬಿತ್ " caught in the Sampangi tank were voracious Larvae feeders, the variety known

as "[illegible]" feeding on 700 Larvae during 24 hours in preference to cooked rice, which was also available More systematic experiments in the mass should be made not only with the smaller kinds of fish but also with other water animals, water insects and water plants before an opinion of any value can be offered From the last part of the Health Officer's report, it is evident that something in the direction of draining of kerosining pools has been attempted during the latter part of the year It would perhaps have been useful if a definite statement had been made as to which the pools were and what the result was, for, draining some pools can have no bearing on malaria except through chance and the efficacy of kerosining a malaria-carrying-mosquito breeding ground needs to be repeatedly tested not only with the view of confirming the death of all existent Larvae but also the prevention of subsequent hatching and growth for a further period - the period of efficacy invariably depending on the situation and size of the pool and its exposure or otherwise to wind currents

The trend of public health with respect to deaths from fevers

Appendix IV shews the average death rate from fevers for every group of 5 years ending successively with every year during the last 15 years The average death rate for a group of 5 years is taken to minimise the corrections that may be necessary on account of accidental circumstances Though the proportion of 'malaria' to 'fevers' may be open to discussion it cannot be doubted that the death rate from fevers will be surely indicative, to some extent at any rate, of the prevalence of malaria A glance at the preceding chart which is worked out on the corrected population of Bangalore City for successive years ending with 1915 shews that taken altogether we have no reason to congratulate ourselves on any remarkable

remarkable improvement within recent years The death rate from fevers of 10.1 per mille in 1901 steadily declined and dropped to 3.3 per 1000 in 1904 There was again a steady rise leading to 5.9 per 1000 in 1908 and though there was a slight tendency to decline during the next two years, there has not only been no diminution during the 4 years ending with 1915 but a distinct tendency towards increase is seen.

10. The foregoing brief analysis of the Health Officer report justifies our coming to the following conclusions -

i Malaria is prevalent in the City

ii The prevalence of malaria has perhaps diminished during the decade 1895-1905 but within the last decade 1905-1915 it has remained constant, if it has not increased

iii It varies in its intensity in the several Divisions of the City. In the Divisions in which investigation was conducted, the 5th and 6th Divisions (Nagarthpet and Lal-bagh Divisions) are almost as badly affected as some of the most unhealthy tracts in the malnad and contrary to our expectations the splenic index of the area beneath the Dharmambudi tank bund is com pardtively low

iv In all Divisions there are large number of breeding grounds for mosquitoes,

(a) But the popular impression of mosquitoes breeding in gutters, drains, box drains, sewers and septic tanks is not confirmed by investigation

[Note.- The clouds of insects that hover in the neighbourhood of drains are not mosquitoes though a few may be hiding in the dark corners of box drains]

(b) The proportion of culex mosquito breading grounds to those of the anopheline is 107 152

Note -

[Note.- This should however not be taken to represent the actual prevalence of these mosquitoes in the City not only are culex larvæ found in enormous number in their breeding places but the mosquitoes usually found in dwelling houses are of the culex variety so that it takes considerable searching before adult anopheline mosquitoes can be caught from houses]

(c) Amongst the anopheline mosquitoes the ratio between those believed to be harmless and those known to convey malaria is 35 117.

(d) Therefore the proportion of all mosquitoes to those known to be concerned in the propagation of malaria is 142 117

(e) The commonst varieties conveying malaria in the City obviously are nyssorhynchus stephansii, myzomya Listoni, and myzomya culicifacies in the order in which they are named

(f) [As far as the results of our investigation in the City go] the malaria-carrying mosquito prefers wells of fresh water specially when the well is in disuse or not much used and ponds and wells of fresh water in garden lands and occasionally breeds also in collections of rain water in shallow pools, pots &c

(g) [As far as the results of our investigation in the City go] the malaria-carrying mosquito does not breed on open drains, box drains, sewers, septic tanks, wells of brackish water, wells in use where there is considerable agitation of water, and sheets of water with a considerable quantity of decaying organic matter and grown offensive They have rarely been found in tanks or large shallow sheets of rain water.

[Note.- I make these statements with some diffidence and subject

subject to correction. It may be that the growth of malaria-carrying mosquitoes in particular pools during certain parts of the year depends an unknown circumstances whereby an innate preference is shewn by all living organisms to particular surroundings. It may also be that if the circumstances are altered like for instance rendering such pools uninhabitable to mosquito Larvæ by draining or by kerosining or some other measure, such malaria-carrying mosquitoes will accustom themselves to other surroundings where there are now only non-malaria-carrying mosquitoes breeding Though in practice therefore it has been known that directing effort towards the malaria-carrying-mosquito Larvæ pools always tends to a steady decline of malaria in a locality, it may be as well to bear in mind that in their struggle for existence and in view to preserve the continuance of the species, all organisms show a remarkable tendency to adapt themselves to their surroundings - however unfavourable and inimical they may be for their flourishing.]

v. As far as the death rates go to show, malaria, if it is not markedly on the increase, is not at any rate on the decrease within the last decade

Recommendations

11 Under this head I merely indicate the broad lines on which measures seem to be called for in the light of the preceding conclusions

i. Educative - The more one watches the course of events or thinks on the measures suited for malaria prevention or any measure of sanitary reform, the more is it borne on the mind that in the absence of active and intelligent co-operation on the part of those for whose

whose benefit the measures are devised, all efforts are utterly futile and end in ignominious failure On the other hand the experience of those that have endeavoured to create any public interest in matters sanitary by means of lectures organised in the usual way cannot but be profoundly depressing Mass education in question affecting public health where cause and effect are often too subtile for ready comprehension, is admittedly a laborious process everywhere and it must be doubly so in a country where even the educated classes often times look upon sanitary precepts and preachings as the amiable ravings of harmless lunatics Yet it must be conceded that the immensity of the obstacle is only an index of the need for a charge in methods, combined with strenuousness of effort There is no dearth of medical and sanitary talent in the City There is also a well equipped laboratory. A large number of educationists, and officers of the educational Department reside in the City. It ought to be easy to flood the area with literature on all public health subjects in a readily assimilable form It ought to be easy with all this talent to organise a lecture bureau that could take up mass education on a wider scale and in a more systematised manner than the rare out-pourings of an executive Health Officer with a heavy charge and a light staff

There is yet another aspect of the question and that is the extraordinary vividness of things taught during boyhood. The impressions gathered during certain years of life remain permanent If therefore it is accepted that measures of sanitary reform are useless in the absence of co-operation and that co-operation cannot be expected without education, it seems to naturally follow that a fair knowledge of the rudiments of physiology and hygine should be made compulsory in our public schools

schools. At present however greater attention is paid to the importance of Godthaab in Greenland and Tamatave in Madagascar than on the situation of the stomach in the abdomen and of its limited dimensions not permitting infinite distension ! Is this not a fit subject for representation by Municipal Councils to Government ?

ii. Executive.- I am of opinion that there are sufficier facts brought out in the Health Officer's report for us to accept that the Tigalary gardens in the 5th and 6th Divisions form for all practical purposes the focus of infection for the City proper No where is malaria so rife as in the immediate vicinity and no where are malaria-carrying mosquitoes breeding in so uniform a manner in almost every pool The acquisition of these lands, the filling up of wells and pools and sub-soil drainage of the area cannot but be attended with the most gratifying results. There is a scheme for the acquisition of land on either side of the Hoskota Road for a certain distance Though this may not be all that is indicated it is yet bound to be a measure of considerable improvement, if for one reason or another it did not get hung up for the next 2 or 3 decades.

It is unnecessary for me to dwell herein on the details of work that should be carried out by the staff that is or may be appointed to carry out anti-malarial measures in the City. Such a staff is necessary not only to complete the enquiry with respect to the defects in the present investigation previously alluded to, to investigate the preponderence of benign or malignant infection, to ascertain any variations in the varieties of mosquitoes breeding in the same pool during the several reasons of the year and to elucidate the periods of the year when what may be called epidemics of malaria occur and the circumstances leading thereto but also to take note of the efficacy of anti-malarial measures on the splenic

splenic index of the population and on the prevalence of malaria-carrying mosquitoes in the City The working-details of such a staff cannot find a place in this note, for the reasons that they vary with circumstances and are familiar to those who are engaged in public health work The writings in the public press go to show that the question of malaria prevention in the malnad improvement scheme has not been placed on a scientific basis. Work undertaken on this behlaf in the City is not unlikely to be useful to the State as a whole and it seems to me that while the cost of all preventive measures should naturally be borne by the Municipality, further investigation may with advantage be taken up by the public health department of the State and the preventive measures carried out by the Municipality at the instance and under the guidance of the Sanitary Commissioner or Director of Public Health Institute.

Amongst executive measures should however be mentioned the desirability of getting <u>all</u> persons suffering from malaria subject to treatment For,, while on the one hand the absence of the malaria-carrying mosquito renders it impossible for the germ to be transferred from one person to another, the absence of the germ itself in peoples blood also renders the chances of such conveyance nil It is therefore very important to aim at the destruction of the germ in the patients' blood All the more is it desirable for this to be resorted to as malaria is one of those diseases that is susceptible to treatment to a most extra-ordinary extent even in its latest stages. It would therefore be a measure of supreme utility if the Medical and Sanitary men in the City as well as the Educationists banded themselves together not only to form a bureau as mentioned in the preceding paragraphs for educative purposes but also to secure the adequate treatment of all persons suffering from malaria coming within their purview If

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Tidy draft

GEN & REV. SECRETARIAT
TYPING Sec
30 JAN 1917
IRS 28

Records report of the Malarial Survey in Bangalore city

File No 156-16
Serial No 2

Proceedings of the Government of His Highness the Maharaja of Mysore

Enc 1 Register + 2 Letters to Sanitary Comr

READ— GO no 206-6 Mil 237-15-4 dt 10-7-16 sanctioning the continuance upto the 30th June 1917 of the temporary establishment at a cost of Rs 84/- p m for work connected with the Malarial Survey of the Bangalore City and President, Municipal Council to submit a report on the work done 1915—16.

2. Letter no Lfs 281 dt 13th Dec 1916

over

hary No of letter replied to B 1902

GENERAL AND REVENUE SECRETARIAT
(Mund)

, the 191

Date of issue 3.2.17

Signed by MVR B Subba Rau

May this be

i printed?

~~ii treated as a standing order?~~

~~iii published in English part of Gazette~~

~~iv translated?~~

~~v placed at the disposal of the Press?~~

~~vi published in the Gazette Kannada part?~~

SUBJECT

GPB—50 000—1 12-13

5/

from the Sanitary Commr submitting with his observations letter no 183 & 21st Nov 1916 from the President, Bangalore City Municipal Council together with the report and note on the Malarial Survey as required in the above Govt order. (x printed as accom paniments)

— . —

Order thereon. — No 49957 ml 5-16-2 2217

The report and the note on the Malarial Survey are recorded

2 As regards the point raised in the Presidents' letter asking the agency to further continue the work of Malarial Surveys &c. Govt agree with the Sanitary Commr that the work should be continued by the Municipal Council

Sanction has already been accorded in the G.O. read above to the retention of the temporary Establishment till 30th June 1917

R. S. 27]

GENERAL AND REVENUE SECRETARIAT

(Continuation sheet draft form.)

3. A report on the work done during 1916-17 should be submitted after the close of the current official year.

DPC 29/1/17

HJ Offg Rev Secy

To
The Board of Commissioners returning enclosures
" President, Municipal Council, Bangalore city with a covering letter
" Comptroller, Mysore Govt

HDM
27/1/17

GPB—20,000—7 7 14

403

Government of His Highness the Maharaja of Mysore.

GENERAL AND REVENUE DEPARTMENTS.

O. No. 4995-7—Ml. 156-16-2, dated 2nd Feb. 1917.

Malarial Survey, Bangalore City.

Records the Report and Note on the—

W D 2039—GIE—6 8-17—255

A Stephensi A Rossi Culex

Block No 3 2nd Division—

Boundaries —

North—Purnaah Chattram Road
East—Tholasithotam Lane
South—T K Road
West—Kottege Lane

General sanitary condition —

This block is very much congested and the houses are ill ventilated Sewage stands stagnant in some of the lanes

Average level of sub soil water—20'
Number of children under twelve years of age examined—97
Number with enlarged spleen—8
Splenic Index—about 8 per cent

No female anopheline mosquitoes were collected within dwellings in this block

All the twenty five wells of this block were examined for mosquito larvae and in 4 of which larvae were found

There are three potential breeding places of which two are wells and one is a ditch

The female anopheline mosquitoes bred from the above wells are—A Rossi and Culex.

Block No 4—

Boundaries —

North—Purnaah Chattram Road
East—Balepet Road
South—T K Road
West—Tholasithotam Lane

General sanitary condition —

This block is also overcrowded and the houses are ill ventilated

Average level of sub soil water—20'
Number of children under twelve years of age examined—239
Number with enlarged spleen—21
Splenic Index—9 per cent

No female anopheline mosquitoes were collected within dwellings

All the sixty two wells of this block were examined for mosquito larvae and in 7 of which, larvae were found

The mosquitoes bred from the above wells are—A Stephensi and Culex

Block No 5 2nd Division—

Boundaries —

North—Tank Road
East—Municipal garden compound wall
South—T K Road
West—Railway Goods shed Road

General sanitary condition—

The houses are overcrowded and ill ventilated

Average level of sub soil water—24'
Number of children under twelve years of age examined—584
Number with enlarged spleen—15
Splenic Index—3 per cent

Number of female anopheline mosquitoes collected within dwellings was 26 and their identification was A Rossi and A Stephensi

Results of Dissection —No parasite was found either in the stomach or in the salivary gland

There are two potential breeding places which are two wells

All the sixty nine wells of this block were examined from mosquitoe larvae and in 13 of which larvae were found and the mosquitoes bred from the above were A Stephensi, A Rossi and Culex

Summary of the whole of 2nd Division that has been yet surveyed is as follows —

Boundaries have been given in the beginning of the report As regards the general sanitary condition, the whole portion of this division is overcrowded and the houses are ill ventilated except some few ones

The average level of sub soil water—22'

Nine hundred and seventy eight children under twelve years of age were examined for enlarged spleen and 46 of them had it So the Splenic Index comes to about 5 per cent nearly The names and addresses of the cases of enlarged spleen have been entered in a register maintained for the purpose As it is extremely difficult to induce children to give their blood for examination, it could not be done on a large scale So blood smears from six children only were taken and no malarial parasite was found in them

The female anopheline mosquitoes collected within dwellings were 28 in number and they were identified as A Stephensi Rossi and Culicifacies and no parasite was found in them after dissection.

The total number of potential breeding places was 15 of which seven are wells seven ditches and one cistern

All the 202 wells were examined for mosquitoe larvæ and in 31 of which larvæ were found There was a pool also in this portion of this Division and larvæ were found in it The identification of mosquitoes bred from the above wells and pools is—A Stephensi A Rossi and Culex

A portion of 1st and 4th Divisions—

Boundaries —

North—Residency Road
East—Sampige Tank Road as far as Queen's Statue.
South—Jail Road and Cenotaph road
West—Avenue road

General sanitary condition—

There are some potential breeding places and wild growth of lantana behind the Government Press and in the surroundings of Residency

Average level of sub soil water—19'

As there are not many residential houses in this locality Splenic Index was not taken

There are only four potential breeding places of which two are wells and two pools

All the thirteen wells that were in this block and also twelve pools, ditches etc were examined for mosquito larvæ In eight of the wells and five of the pools larvæ were found

The mosquitoes bred from the above are identified as Anopheline Rossi Culex and Anopheline Listoni

5th Division—

The boundaries of the whole of the 5th Division are the following —

North—Nagarthpet
East—Mission Road
South—Hoskote Road
West—Avenue Road

As mentioned in the beginning of the report the whole area bounded by the above named boundaries is divided into as many blocks as it was convenient for us to work in The detail work of each block is as follows —

Block No 1—

Boundaries —

North—Taluk Cutcherry Road
East—Kemmannu Gundy Road
South—Bhadrappa's Road
West—Venkataramana Naik's and Advocate Ramaswami Setti's Lane

General sanitary condition—

The whole block is overcrowded and most of the houses are ill ventilated and some have no ventilation at all The sewage stagnates in most of the drains of the bye lanes some of the houses have yet pit system of conservancy due to the want of conservancy lanes

Average level of sub soil water—13'
Number of children under twelve years of age examined—430
Number with enlarged spleen—110
Splenic Index—25 per cent nearly

Twenty female anopholene mosquitoes were collected within dwellings and they were identified as A. Listoni Stephensi Rossi And on dissection of the above no parasite was found either in the stomach or in the salivary glands All the forty wells that were in this block were examined for mosquito larvæ and in 4 of which larvæ were found and the mosquitoes bred from the above were identified as Culex and Anopheline Stephensi

Block No 2—

Boundaries

North—Bhadrappa's Lane
East—Cross road joining Nagarthpet and Hoskote Road
South—Hoskote Road
West—Gardens and Benkinawab's Street

General sanitary condition—

The same as the above block but this one contains wild growth of lantana in addition

Average level of sub soil water—7'
Number of children under twelve years of age examined—118
Number with enlarged spleen—93
Splenic Index 78 per cent

Twenty female anopheline mosquitoes were collected within dwellings and they were identified as A Stephensi, A Rossi and on dissection no parasite was found in them

All the forty seven wells that contained in this block, were examined for mosquitoes larvæ and in 11 of which they were found The mosquitoes bred from the above were identified as A Stephensi, Rossi and Culex

Block No 3—

Boundaries —

North—Bhadrappa s Street
East—Mandy Erappa s Lane and Gardens
South—Hoskote Road
West—Avenue Road

General sanitary condition—

The same as the above except that there is a reservoir of sewage in the gardens behind the dwel ling houses of this part of 5th Division

Average level sub soil water—3½ '
Number of children under twelve years of age examined—200
Number with enlarged spleen—93
Splenic Index—46 per cent

Twenty female anophelene mosquitoes were collected within dwellings and they were identified as A Rossi , and on dissection no parasite was found in any one of them

All the 102 wells were examined for mosquito larvæ and in 13 of which larvæ were found The mosquitoes bred from the above were A Stephensi A Rossi, Culex

There was also found a tubful of mosquito larvæ and the mosquitoes bred from them were Culex

Block No 4—

Boundaries —

North—Nagarthpet
East—Venkataramana Naik s Lane
South—Bhadrappa s Lane
West—Avenue Road

General sanitary condition—

The whole block is overcrowded and the houses are ill ventilated except a few good bungalows, almost all houses have pit system of conservancy due to the want of conservancy lanes

Average level of sub soil water —14'
Number with enlarged spleen —73
Number of children under 12 years of age examined —678
Splenic Index —11%

Twenty female anophelene mosquitoes were collected within dwellings and they were identi fied as anophelene Stephensi and on dissection no parasite was found in them All the 112 wells of this block were examined for mosquito larvæ and in 16 of which, larvæ were found The mosquitoes bred from the above wells were identified as A Stephensi and Culex There was also found one potful of larvæ and the mosquitoes bred from them were A Stephensi

Block No 5—

Boundaries —

North—Nagarthpet
East—Mission Road
South—Hoskote Road
West—Lane joining the Nagarthpet and Hoskote Road

General sanitary condition—

There are one or two dilapidated houses where nuisance is being committed by the neighbours

Average level of sub soil water —6½'
Number of children under 12 years of age examined —12
Number with enlarged spleen —1
Splenic Index —8%

All the 6 wells in this block were examined for mosquito larvæ and in 20 of which larvæ were found the mosquitoes bred from them were identified as Culex and A Stephensi

Summary of the whole of the 5th Division is as follows —

The boundaries of the whole of the 5th Division have been given in the beginning —

General sanitary condition—

The whole division is overcrowded and houses are ill ventilated The drainage in some of the portions is not good Majority of houses have pit system of conservancy In some places there are growths of lantana

Average level of sub soil water —8'

One thousand four hundred and thirty eight children were examined for enlarged spleen in this division and 370 of them had it The splenic index of the whole Division comes to about 25% The addresses of those who had enlarged spleen have been entered in the register maintained for the purpose.

As it was extremely difficult to induce children to give blood for examination it could not be done on a large scale, so blood smears from only five boys were taken and no parasite was found in them

The number of female anophelene mosquitoes collected within dwellings is 80 and they have been identified as A Stephensi Rossi and Culex.

There were 4 potential breeding places and all of them are wells The rest 307 wells were examined for mosquito larvæ and in 48 of which larvæ were found and the mosquitoes bred from them were identified as A Stephensi Rossi and Culex There was one potful of larvæ found and the mosquitoes bred from which were A Stephensi and one tubful of Culex larvæ

6th Division —

Boundaries —

North—Hoskote Road
East—Lal Bagh and Mission Road
South—Lal Bagh West Gate Road and Basavanagudi Road
West—Hosur Road or Kalasipalyam Road

The whole area bounded by the above named boundaries is divided into 4 blocks namely —

1 Kalasipalya and its surroundings
2 Gangamcherry and its surroundings
3 Korcharpalya and its surroundings
4 Dodmavalli Chikmavalli Ooparahalli and their surroundings

1 Gangamcherry and its sorroundings —

Boundaries —

North—Hoskote Road
East—Wesleyan Mission School and gardens near Lal Bagh
South—Mavalli Tank
West—Hosur Road and Lascar Lines

General sanitary condition—

Seventy five per cent of the dwelling houses are ill ventilated No drains or proper roads are made for the whole block People of this block complain for insufficiency of water taps There are also wild growths of lantana in certain places

Average level of sub soil water — 10½'
Number of children under 12 years of age examined —5 201
Number with enlarged spleen —117
Splenic Index —22%

Twenty female anophelene mosquitoes were collected within dwellings and they were identified as A Rossi Listoni and Stephensi on dissecting them no parasite was found

There were 2 potential breeding places of which one is a well and the other a ditch

All the 112 wells of this block were examined for mosquito larvæ and in 51 of which larvæ were found and there were other breeding places as pots stone mortar cisterns total being 5 in number The musquitoes bred from the wells and other breeding places were identified as A Rossi Stephensi Listoni Nigerrimus Culicifacies and Culex

2 Kalasipalyam and its surroundings—

Boundaries —

North—Lascar Lines
East—Gardens and Slaughterhouse
South and West—Hosur Road

General sanitary condition—

Most of the houses are overcrowded and ill ventilated There are many dilapidated buildings which are in dangerous condition and which have been the cause of great nuisance to the neighbours The back yard of some of the houses have been overgrown with wild shrubs and lantana The lower part of Nimbojigalli is not well drained and as such the sewage stagnates here and there emanating abominable smell

Average level of sub soil water +—22
Number of children under 12 years examined —343
Number with enlarged spleen —134
Splenic Index —36%

Twenty eight female anophelene mosquitoes were collected within dwellings and they were identified as A Rossi Fuliginoses Culex and on dissecting them no parasite was found

There are 6 potential breeding places and they are wells

The rest 160 wells and 6 pools were examined for mosquito larvæ and in 20 of the wells and 3 of the pools larvæ were found and the mosquitos bred from them were identified as A Listoni Stephensi Culicifacies Barbirostris Nigerrimus and Culex

3 Koracharapalya and its surroundings —

Boundaries —

North—Hosur Road and Koracharapalya main road
East—Roshun Bagh Road
South—Gardens of Basvangudi
West—Vokkaligara Sangha Hostel

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General sanitary condition—

There is no proper drainage and most of the houses are ill ventilated The surroundings of this block are kept very dirty by the collection of rubbish and overgrowth of lantana There are many dilapidated houses which are made use of as public latrines

Average level of sub soil water —31'
Number of children under 12 years of age examined —288
Number with enlarged spleen —24
Splenic Index —8%

Fifty female anopheline mosquitoes were collected within dwellings and they were identified as A Listoni, Culicifacies and on dissecting no parasite was found in them

There are 8 potential breeding places which are all wells The rest 43 wells were examined for mosquito larvæ and in 5 of which they were found The mosquitoes bred from them were identified as A Listoni Culex

4 Doddamavalli Chickamavalli and Ooparahalli —

Boundaries —

North—Mavalli Tank
East—Lal Bagh
South—Lal Bagh West Gate Road
West—East Road Basavangudi

Average level of sub soil water —22

General sanitary condition—

Most of the houses near Lal Bagh are dilapidated and there is a wild growth of lantana in these houses and their neighbourhood so that it is very difficult to see our way through it Almost all houses are ill ventilated and kept very dirty by the collection of cowdung etc Drainage is bad in this block People of this block are suffering very much for the supply of drinking water since the number of taps that are kept open is too few and very far from their residences The whole of this block has pit system of conservancy

Number of children under 12 years of age examined —410
Number with enlarged spleen —130
Splenic Index —31%

Twenty female anopheline mosquitoes were collected within dwellings and they were all Rossi No parasite was found in them after dissection

There are 26 potential breeding places including wells ditches, etc One hundred and thirty eight wells 1 pool 7 pots cisterns etc were examined for mosquito larvæ and in 25 of the wells, 1 pool and 7 pots cisterns etc larvæ were found and the mosquitoes bred from them were identified as stegomyia fasciata Culex A Stephensi Rossi

The following is the summary of the work done in the whole of the 6th Division —

Boundaries —Given in the beginning

General sanitary condition—The same as that of block 4 in 6th Division namely —

Doddamavalli Chickamavalli and Ooparahalli

Average level of sub soil water —21
Number of children under 12 years of age examined —1 561
Number with enlarged spleen —405
Splenic Index —26% nearly

As it was very difficult to induce children to give their blood for examination it could not be done on a large scale So blood from 2 boys only were taken and no parasite was found in them

The female anopheline mosquitoes collected within dwellings were 128 in number and they were identified as A Rossi Listoni Stephensi fuliginosus Culicifacies and Culex On dissecting them no parasite was found either in the stomach or in salivary glands

There are 42 potential breeding places including wells ditches, etc

All the 453 wells and 7 pools were examined for mosquito larvæ and in 106 of the wells and 4 of the pools larvæ were found Larvæ were also found in 12 other breeding places as pots tubs etc The Mosquitoes bred from these are identified as —

A Rossi Stephensi Listoni Culicifacies Barbirostris Nigerrimus, Culex, Stegomyia

Summing up then the result of our last year s work we see that the 5th and 6th Divisions are particularly more malarious and liable to infection than any of the other portions of the City yet surveyed This is particularly due to the level of sub soil water being as high as 8 in 5th Division and also lack of drainage

The general sanitation of these Divisions also is far from being satisfactory due to the overcrowding of the houses their ill ventilation and lack of daily conservancy system During our survey work we met with many dilapidated houses overgrown with lantana and other shrubs One particularly striking feature about these Divisions was the unusually large number of pools and wells which contained mosquito larvæ there being 48 307 such places in 5th Division and as many as 122 453 in the 6th Division

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It is not surprising then that the Splenic Index should also be unusually high, being [illegible] 26% respectively in the 5th and 6th Divisions As was to be expected from such a state [illegible] the number of female anophelene mosquitoes collected within dwellings was large being 12[illegible] 6th and 80 in the 5th Divisions It was very noticeable that even among the adult and [illegible] there were such enlarged spleens as to occupy the whole of the abdomen What else b[illegible] can be the cause of these sickly looking and anemic faces!

There is not much to say about the other portions of the City surveyed But this does not mean that the locality is altogether devoid of malaria A look at the statistics collected will show that even in these Divisions there are cases of enlarged spleen

In conclusion then we would bring to the notice of the Government that unless means such as mosquito reduction and prevention by treatment are taken and that too quickly there is no salvation for these poor people to get rid of the malaria pest A malaria free Bangalore will only be possible when breeding places are avoided and the people are given better sanitation, conservancy drainage and good treatment Fortunately malaria is of all diseases the one regarding which we possess perhaps the fullest knowledge since we know the cause of it the manner in which it is spread a specific cure for it and efficient methods of prevention It is our own fault if we do not reduce it as much as possible

We may add also wherever the mosquito pest was very troublesome, the insanitary and stagnant pools were treated with kerosene oil and drained off and whenever possible filled up For carrying on a systematic and organised anti malarial campaign it is necessary as a preliminary step to undertake a malarial survey When this is completed proposals will be submitted for the proposed campaign In the meantime as we are going on with our survey we wherever possible do every effort to minimise the prevalence of malaria

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II MEMO—*drawn up by Mr R Subba Rao Offg Senior Vice President*

In submitting herewith the Health Officer s report on the malarial survey of the City I beg to add the following remarks this might perhaps to some extent be necessary as the Municipal Council sanctioned the scheme at my instance and I was in charge of the survey work during the 1st half of the period covered by the report

2 It will not be forgotten that the malarial survey of the City was necessitated by the too unauthorised an assumption of the existence of malaria in the City to any or some extent Blood examination neither was nor is a routine procedure the various kinds of mosquitoes prevailing in the City had not been classified and no attempt had been made to gauge the extent of malarial infection in the City Yet it was known that there were numbers of children with enlarged spleen in most parts of the City The swarms of mosquitoes during certain parts of the year and the coincident occurrence of an extraordinarily large number of fever cases naturally led to the impression that malaria must be prevalent to an indefinite extent Some people held that the public health of the City under this head was steadily deteriorating while others adopted a more complaisant attitude in either case without sufficient reason while in its anxiety to be doing something the Health Department in a spasmodic manner treated pools with gas works waste and kerosiene oil emulsion without endeavouring to ascertain to what extent this did not result in the frittering away of energy time and labour not to speak of the false sense of security engendered in the mind of the public It was a consideration of all these circumstances that led to the Municipal Council directing an investigation into the subject in their resolution dated 29th August 1914 The necessary staff however was only available by the end of the year 1914 15 so that the survey work really was taken up from the commencement of the year 1915 16

3 The staff appointed for the purpose consisted of a Sub Assistant Surgeon a draftsman and two peons at a total cost of Rs 84 per mensem Liberal provision had been made for the purchase of books and appliances The total expenditure incurred during the year came to Rs 1 054 12 1 The Sanitary Commissioner also was pleased to sanction an expenditure of Rs 228 12 0 out of State Funds for the purchase of microscopes and apparatus primarily for the purpose of demonstration during public lectures and these were also used in the Malaria Laboratory during the course of the enquiry

The areas wherein the survey work was carried out (*vide* Appendix I) comprised of the Cubbon Park and its surroundings in the 1st Division all the locality beneath the Dharmambudhi tank bund up to the Taluk Cutcherry road in the 2nd Division and the whole of the 5th and the 6th Divisions

4 The investigation undertaken may be classified under the following heads —

i Is malaria prevalent in the City? If so to what extent? Is it on the increase or decrease?
ii What are the circumstances if any that tend to keep it up or to facilitate its propagation?
iii What measures are indicated in the light of the preceding facts to minimise if not eradicate its prevalence?

The basis of the report

5 The doubt expressed in the first sub section of the preceding paragraph with regard to the existence or otherwise of malaria in the City might provoke some amusement as both Medical men

and fathers have only too commonly accepted the view in the affirmative The diagnosis is usually made from the clinical symptoms and as already stated it is uncommon for the diagnosis being confirmed by blood examination except perhaps in the Victoria Hospital The test of a fever having been malarial in origin is frequently its ready amenability to quinine rather than quinine being administered in a known case of malaria I cannot say that an endeavour has been made in our investigation to remedy this defect partly because the Health Officer is vested with too many responsibilities to be able to devote much attention to pathological work and partly owing to the programme embracing too wide a range of study for a small and unskilled staff Barring the identification of the Malarial Parasite in every case pronounced to be malaria the most reliable test of its existence is the occurrence of chronically enlarged spleen with the coincident prevalence of mosquitoes known to propagate malaria We devoted most of our time to these aspects of the question and though the results of our enquiries are for the reason specified above not as scientifically accurate as they should have been, I have still no doubt that they are of sufficient value for taking practical action towards the initiation of effective anti malarial measures The basis then of this report is an enquiry (*a*) concerning the extent of chronically enlarged spleen in persons most susceptible to malarial infection (*b*) into the malaria carrying mosquitoes prevailing in the City and (*c*) into the recorded statistics of deaths under fevers If it were justifiable to assume that a certain proportion of fevers was invariably due to malaria an investigation into the trend of public health of the City for a number of years with respect to the death rate under fevers will give us a rough idea of the progressive increase decrease or equilibrium in the prevalence of malaria in the City

6 With regard to the second sub section of paragraph 3 the only known method of propagation of malaria being through particular varieties of mosquitoes our efforts were directed towards the examination of all places known or suspected to be or become the breeding grounds of mosquitoes Absolute proof of a particular variety of mosquito conveying malaria is the identification in its tissues of the malaria parasite undergoing various stages of development We should therefore have dissected a very large number of mosquitoes and confirmed our conclusions by this infallible test but as I have already explained this would only have been possible if the Health Officer was exclusively set on this work It should however be mentioned that certain varieties of mosquitoes known to be pre eminently associated with the conveyance of malaria in Upper India Madras Ootacamund etc do also exist in the City and the extraordinary coincidence of their breeding grounds and the existence of cases of enlarged spleen in the immediate neighbourhood can lead only to one conclusion The most hopeful circumstance from our point of view is the comparatively small number of places where such mosquitoes are found to breed compared with the numerous breeding grounds (actual or potential) that abound in the City

A great deal of attention was paid to the identification of the several kinds of mosquitoes The identification of closely allied species is no easy matter and I had to frequently get the results of my identification confirmed with specimens by Doctor Christophers of the Kasauli Research Institute I also took occasion to secure the assistance of Rao Bahadur Khazan Chand (one of the Assistants at the Research Institute) when he was at Bangalore on a short visit

7 With regard to the 3rd item specified in para 3 it was not possible to pay any great attention to the natural causes that are inimical to the growth of mosquitoes Some experiments were made with varieties of fish but this was done more in a spirit of curiosity than on the large scale necessary for the deduction of scientific results

The method of work

8 A reference to Appendix II shews that after defining the boundaries of an area a general impression of the sanitary condition of the locality was first noted down The Sub Assistant Surgeon next proceeded to examine the children in the locality for enlarged spleen The address of infected children was noted Simultaneously specimens of mosquitoes were caught from dwellings for subsequent examination The staff next proceeded to measure and note on the block plan all potential and actual pools existent in the area By potential pools should be understood hollows or pits where there was no water at the time of examination but which could during and after rains contain water taking varying intervals of time for drying up All pools tanks wells etc were repeatedly examined for mosquito larvæ and numbers of them collected and carried to the Laboratory for further growth The depth of the sub soil water in each locality was measured and the brackishness or potability of each specimen examined In the Laboratory the larvæ grew up into the adult forms within varying periods ranging from a few days to three or four weeks and the specimens were destroyed after identification The block plans Appendix III explain the examination conducted under this head Potential pools are marked white pools or wells containing water without mosquito larvæ are marked faint blue pools or wells containing Culex mosquito larvæ (non malaria carrying) are marked green pools containing non malaria carrying anophelene larvæ are marked yellow pools or wells wherein the malaria carrying mosquito was found to breed are marked deep red A glance at these block plans will readily show the extent to which malaria carrying mosquitoes breed in any locality In block plans 7 and 10 an effort has been made to demonstrate the relationship between such pools and splenic cases in the neighbourhood Appendix IV is the graphic representation of the trend of public health in the City within the last 15 years in respect of deaths from fevers

Brief analysis of the report

9 I now propose to make a brief analysis of the Health Officer's report to render intelligible the salient features of the preceding investigation

The splenic index —The prevalence of malaria is by the common consent of sc[illegible] gauged by the splenic enlargements in persons under 12 years of age Adults may and do sometimes have enlarged spleen but as there is a tendency for the acquisition of greater or lesser immunity as age advances, the examination is usually restricted to individuals who are of the most susceptible age Any alteration in the method would involve want of uniformity for purposes of comparison

Division	Block	Number of children examined	Number of children that had enlarged spleen	Splenic index as percentage
II	1	81	1	3·2
	2	27	1	3 7
	3	97	8	8 2
"	4	239	21	8·8
V	5	584	15	2 6
	1	430	110	25 6
	2	118	93	78·8
"	3	200	93	46.5
"	4	678	73	10 8
"	5	12	1	8 3
VI	1	530	117	22·5
"	2	443	134	99 0
"	3	288	24	8·3
"	4	410	130	31·7
Total		3,977	821	20 6

Out of a total number of 3 977 children under 12 years of age examined 821 had enlarged spleen giving a ratio of over 20 6% The marginally noted statement shews the splenic indices of the various component blocks of the several Divisions wherein investigation was conducted Compare these figures with the following being the splenic indices of some of the towns in the State known for the unsatisfactory state of their public health *viz* Mudgere 27% Koppa 67 3% Harihapur 30 5% Chikmagalur 12 08 Heggaddevankote 25 4%

The level of sub soil water

As will be seen from the marginal statement the average level of sub soil water in the several blocks varies from 3½′ in the 3rd block of the 5th Division to 21′ the average level in the 2nd Division I do not think that there are at present sufficient data to specifically connect the level of the sub soil water with the prevalence of malaria but a reference to the plans of the 2nd and 3rd blocks of the 5th Division and to the statement of splenic indices cannot but be suggestive

Division	Block	Level of sub-soil water in feet
II	1	25
	2	22½
	3	20
	4	20
	5	24
V	1	13
	2	7
	3	3½
	4	14
	5	6
VI	1	10½
	2	22
	3	31
	4	22

The prevalence of mosquitoes

In the areas of the City wherein investigation was conducted there were altogether 987 pools containing water at the time of examination There were in addition 80 hollows where water would stagnate during rains The size shape and situation of each pool are shewn on the block plans accompanying the report The pools specified here include tanks ponds wells nullas culverts etc 753 of them were free of mosquito larvæ 107 grew culex mosquitoes and 152 grew anophelene These numbers do not include non constant breeding grounds like flower pots tubs tins etc Fighteen such breeding grounds were identified in 12 of which culex mosquitoes grew and anophelene in 6 (Rossi 2 and Stephansi 4) They were done away with during the course of the examination The apparent discrepancy which looks like the total of the parts being greater than the whole is due to culex and anopheles growing together in the same breeding ground in 20 instances In the few instances where culex and anopheles mosquitoes grew in the same pool the latter has been given the color appropriate to the anopheles found therein Out of 152 breeding pounds where the anophelene were growing 35 grew a Rossi 74 grew nyssorhynchus stephensi 23 grew myzomya listoni 3 grew myzomya culicifacies 5 grew myzorhynchus nigerrimus 1 grew myzorynchus Barbirostris 1 grew nyssomyzomya Ludlowi 1 grew nyssorhynchus maculipalpis 2 grew both a Rossi and myzomya listoni 1 grew myzomya listoni and myzomya culicifacies 1 grew a Rossi and myzorhynchus Nigerrimus 3 grew a Rossi and myzorynchus Barbirostris 1 grew nyssorhynchus stephensi and myzorynchus Barbirostris and 1 grew nyssorhynchus Stephensi and nyssomyzomya Ludlowi The variety anopheles Rossi is not known to convey malaria The varieties nyssorhynchus stephensi myzomya listoni and myzomya culicifacies are known to be most commonly concerned in the propagation of malaria in other parts of India The several block plans shew vividly the breeding grounds of these mosquitoes and as I have already indicated the clustering of splenic cases in the neighbourhood of these pools (see block plans 7 and 10) is no mere accidental circumstance and justifies our concluding that these varieties are also concerned with the propagation of malaria in the City It will also be noticed that the prevalence of malaria diminishes according to the distance from such pools though I am not prepared to define the ratio between distance and diminution Incidentally this throws light on the habit of the mosquito which renders it almost akin to human beings in being constitutionally non migratory Of 117 places wherein malaria carrying mosquitoes were breeding 47 were fresh water wells in Tigalars gardens with an average depth of sub soil water of 9 feet 37 were fresh water wells in residential parts of the City close to the preceding with an average depth of sub soil water of 13½ feet 10 were disused fresh water wells in busy parts of the City with an average depth of sub soil water of 23 feet 18 were fresh water wells in active use with an average depth of sub soil water of 19½ feet and 5 were shallow pools of rain water in the Cubbon Park and Mavalli Generally speaking the variety known as nyssorhynchus stephensi seems to affect *deep wells of fresh water* specially when in disuse and myzomya listoni *the shallow wells* of lands It is not a little curious that the water edge of the Dharmambudhi Tank was remarkably free of mosquito larvæ a few of the culex kind being found after a good deal of search

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Circumstances inimical to the growth of mosquitoes —I have stated in an earlier part of my memorandum that a serious defect in the investigation was the utter absence of systematic effort in enquiring into the natural circumstances inimical to the growth of mosquito larvæ in general and of the malaria carrying mosquito in particular On the general assumption that the smaller varieties of fish tend to the disappearance of mosquito larvæ in water I conducted a few simple experiments during the early part of the year The kinds known as "ಮುಚಳಿ," "ಸಾಸಮ" and "ಕೊಬಸೆ" caught in the Sampangi tank were voracious larvæ feeders the variety known as "ಮುಚಳಿ" feeding on 700 larvæ during 24 hours in preference to cooked rice which was also available More systematic experiments in the mass should be made not only with the smaller kinds of fish but also with other water animals, water insects and water plants before an opinion of any value can be offered From the last part of the Health Officer s report it is evident that something in the direction of draining or kerosining pools has been attempted during the latter part of the year It would perhaps have been useful if a definite statement has been made as to which the pools were and what the result was for draining some pools can have no bearing on malaria except through chance and the efficacy of kerosining a malaria carrying mosquito breeding ground needs to be repeatedly tested not only with the view of confirming the death of all existent larvæ but also the prevention of subsequent hatching and growth for a further period the period of efficacy invariably depending on the situation and size of the pool and its exposure or otherwise to wind currents

The trend of public health with respect to deaths from fevers —Appendix IV shews the average death rate from fevers for every group of five years ending successively with every year during the last fifteen years The average death rate for a group of five years is taken to minimise the corrections that may be necessary on account of accidental circumstances Though the proportion of Malaria to fevers may be open to discussion it cannot be doubted that the death rate from fevers will be surely indicative to some extent at any rate of the prevalence of malaria A glance at the preceding chart which is worked out on the corrected population of Bangalore City for successive years ending with 1915 shews that taken altogether we have no reason to congratulate ourselves on any remarkable improvement within recent years The death rate from fevers of 10·1 per mille in 1901 steadily declined and dropped to 3 3 per 1 000 in 1904 There was again a steady rise leading to 5 9 per 1 000 in 1908 and though there was a slight tendency to decline during the next two years there has not only been no diminution during the four years ending with 1915 but a distinct tendency towards increase is seen

10 The foregoing brief analysis of the Health Officer s report justfies our coming to the following conclusions —

i Malaria is prevalent in the City

ii The prevalence of malaria has perhaps diminished during the decade 1895 1905 but within the last decade 1905 1915 it has remained constant if it has not increased

iii It varies in its intensity in the several Divisions of the City In the Divisions in which investigation was conducted the 5th and 6th Divisions (Nagarthpet and Lal bagh Divisions) are almost as badly affected as some of the most unhealthy tracts in the malnad and contrary to our expectations, the splenic index of the area beneath the Dharmambudhi tank bund is comparatively low

iv In all Divisions there are large number of breeding grounds for mosquitoes

(*a*) But the popular impression of mosquitoes breeding in gutters drains box drains sewers and septic tanks is not confirmed by investigation

[NOTE —The clouds of insects that hover in the neighbourhood of drains are not mosquitoes though a few may be hiding in the dark corners of box drains]

(*b*) The proportion of culex mosquito breeding grounds to those of the anophelene is 107 152

[NOTE —This should however not be taken to represent the actual prevalence of these mosquitoes in the City not only are culex larvæ found in enormous number in their breeding places but the mosquitoes usually found in dwelling houses are of the culex variety so that it takes considerable searching before adult anophelene mosquitoes can be caught from houses]

(*c*) Amongst the anophelene mosquitoes the ratio between those believed to be harmless and those known to convey malaria is 35 117

(*d*) Therefore the proportion of all mosquitoes to those known to be concerned in the propagation of malaria is 142 117

(*e*) The commonest varieties conveying malaria in the City obviously are nyssorhynchus stephensi myzomya listoni and myzomya culicifacies in the order in which they are named

(*f*) As far as the results of our investigation in the City go the malaria carrying mosquito prefers wells of fresh water specially when the well is in disuse or not much used and ponds and wells of fresh water in garden lands and occasionally breeds also in collections of rain water in shallow pools pots etc

(*g*) As far as the results of our investigation in the City go the malaria carrying mosquito does not breed on open drains box drains sewers septic tanks wells of brackish water wells in use where there is considerable agitation of water and sheets of water with a considerable quantity of decaying organic matter and grown offensive They have rarely been found in tanks or large shallow sheets of rain water

[Note —I make these statements with some diffidence and subject to correction It may be that the growth of malaria-carrying mosquitoes in particular pools during certain parts of the year depends on unknown circumstances whereby an innate preference is shewn by all living organisms to particular surroundings It may also be that if the circumstances are altered like for instance rendering such pools uninhabitable to mosquito larvæ by draining or by kerosining or some other measure, such malaria-carrying mosquitoes will accustom themselves to other surroundings where there are now only non-malaria-carrying mosquitoes breeding Though in practice therefore, it has been known that directing effort towards the malaria-carrying mosquito larvæ pools always tends to the steady decline of malaria in a locality it may be as well to bear in mind that in their struggle for existence and in view to preserve the continuance of the species all organisms show a remarkable tendency to adapt themselves to their surroundings however unfavourable and inimical they be for their flourishing.]

v As far as the death rates go to show, malaria, if it is not markedly on the increase is not at any rate on the decrease within the last decade

Recommendations

11 Under this head I merely indicate the broad lines on which measures seem to be called for in the light of the preceding conclusions

i *Educative* —The more one watches the course of events or thinks on the measures suited for malaria prevention or any measure of sanitary reform the more is it borne on the mind that in the absence of active and intelligent co-operation on the part of those for whose benefit the measures are devised, all efforts are utterly futile and end in ignominious failure On the other hand the experience of those that have endeavoured to create any public interest in matters sanitary by means of lectures organised in the usual way cannot but be profoundly depressing Mass education in questions affecting public health where cause and effect are often too subtle for ready comprehension is admittedly a laborious process everywhere and it must be doubly so in a country where even the educated classes oftentimes look upon sanitary precepts and preachings as the amiable ravings of harmless lunatics Yet it must be conceded that the immensity of the obstacle is only an index of the need for a change in methods, combined with strenuousness of effort There is no dearth of medical and sanitary talent in the City There is also a well equipped laboratory A large number of educationists and officers of the Educational Department reside in the City It ought to be easy to flood the area with literature on all public health subjects in a readily assimilable form It ought to be easy with all this talent to organise a lecture bureau that could take up mass education on a wider scale and in a more systematised manner than the rare out pourings of an executive Health Officer with a heavy charge and a light staff

There is yet another aspect of the question and that is the extraordinary vividness of things taught during boyhood The impressions gathered during certain years of life remain permanent If therefore it is accepted that measures of sanitary reform are useless in the absence of co operation and that co operation cannot be expected without education it seems to naturally follow that a fair knowledge of the rudiments of physiology and hygiene should be made compulsory in our public schools At present however greater attention is paid to the importance of Godthaab in Greenland and Tamatave in Madagascar than on the situation of the stomach in the abdomen and of its limited dimensions not permitting infinite distension! Is this not a fit subject for representation by Municipal Councils to Government?

ii *Executive* —I am of opinion that there are sufficient facts brought out in the Health Officer's report for us to accept that the Tigalars gardens in the 5th and 6th Divisions form for all practical purposes the focus of infection for the City proper Nowhere is malaria so rife as in the immediate vicinity and nowhere are malaria carrying mosquitoes breeding in so uniform a manner in almost every pool The acquisition of these lands, the filling up of wells and pools and sub soil drainage of the area cannot but be attended with the most gratifying results There is a scheme for the acquisition of land on either side of the Hoskota road for a certain distance Though this may not be all that is indicated it is yet bound to be a measure of considerable improvement if for one reason or another it did not get hung up for the next 2 or 3 decades

It is unnecessary for me to dwell here on the details of work that should be carried out by the staff that is or may be appointed to carry out anti malarial measures in the City Such a staff is necessary not only to complete the enquiry with respect to the defects in the present investigation previously alluded to to investigate the preponderence of benign or malignant infection to ascertain any variations in the varieties of mosquitoes breeding in the same pool during the several seasons of the year and to elucidate the periods of the year when what may be called epidemics of malaria occur and the circumstances leading thereto but also to take note of the efficacy of anti malarial measures on the splenic index of the population and on the prevalence of malaria carrying mosquitoes in the City The working details of such a staff cannot find a place in this note for the reasons that they vary with circumstances and are familiar to those who are engaged in public health work The writings in the public press go to show that the question of malaria prevention in the malnad improvement scheme has not been placed on a scientific basis Work undertaken on this behalf in the City is not unlikely to be useful to the State as a whole and it seems to me that while the cost of all preventive measures should naturally be borne by the Municipality further investigation may with advantage be taken up by the public health department of the State and the preventive measures carried out by the Municipality at the instance and under the guidance of the Sanitary Commissioner or Director of Public Health Institute

Amongst executive measures should however be mentioned the desirability of getting *all* persons suffering from malaria subject to treatment For while on the one hand the absence of the malaria carrying mosquito renders it impossible for the germ to be transferred from one person to another,

the absence of the germ itself in peoples blood also renders the chances of such conveyance nil. It is therefore very important to aim at the destruction of the germ in the patients blood All the more is it desirable for this to be resorted to as malaria is one of those diseases that is susceptible to treatment to a most extraordinary extent even in its latest stages It would therefore be a measure of supreme utility if the Medical and Sanitary men in the City as well as the Educationists banded themselves together not only to form a bureau as mentioned in the preceding paragraphs for educative purposes but also to secure the adequate treatment of all persons suffering from malaria coming within their purview If an earnest effort is made it may not be impossible to gather into such an association a sufficient number of medical men who would voluntarily seek out patients and treat them in their own houses if necessary free of all charges I shall not dwell on that aspect of the Government order which enjoining the levy of fees for treatment in the Hospitals and Dispensaries of the City renders it peculiarly ill suited to the working of any such scheme as the question has already formed the subject of more than one representation by the Municipal Council

iii *Legislative* —It is perhaps too premature to think of legislative measures for the prevention of malaria at the present time It may be that the result of further investigation and experience in anti malarial operations will dictate the necessity for the introduction of bye laws empowering the Municipality to order the closing up or enjoining some other method of treatment of certain wells ponds or pools to direct their own conditions of water tidiness in dwelling houses to render it obligatory on the part of school masters to report cases of enlarged spleen amongst the children to ensure their securing proper medical treatment The ultimate aim of all efforts towards disease prevention should be the bringing into existence of that stage of progress not only in preventive methods but also in their ready comprehension by the public at which the initiative can be fixed on the individual citizen with reasonable chances of his fulfilling his obligations It is at this stage that the utility of bye-laws comes in How soon this stage will be attained depends upon the energy with which the enquiry is pursued and the earnestness with which the measures specified in the preceding two paragraphs are worked